Project Fact Sheet

New Electronic Technologies for Volumetric Metering of Delivered Water – Magnetic, Doppler, Vortex Shedding and Ultrasonic Flow Measurement

GOALS

- Provide farmers and irrigation districts with practical means of measuring the volumes of water delivered, spilled, reused, etc.

PROJECT DESCRIPTION

Magnetic and ultrasonic flow measurement technologies have been installed in a few irrigation districts over the past 5 years. However, these applications have all been on large pipelines or large canals. With a cost that varies from about $5,000 - $30,000 per site (material only), they are prohibitively expensive for permanent use on individual farm turnouts. Doppler meters have been used successfully for large river and ocean flow rate measurements, but are not used in irrigation districts. Vortex shedding, to the knowledge of ITRC, is a principle that has never been used in irrigation districts. However, vortex shedding is commonly used in the petro-chemical industries.

Mace AgriFlo ultrasonic Doppler flow meter installed at PID

Present Doppler, vortex shedding, magnetic and ultrasonic technologies sometimes guarantee an accuracy of better than 2%, whereas ±5% accuracy would be excellent for a farm turnout. However, the 2% accuracy on large scale has been questioned. There is a need to research devices using these technologies for large-scale measurement, and to also investigate their application on smaller turnouts.

This research would examine these technologies to determine how well they work and what, if any modifications could be made to reduce the cost.

Unidata Starflow Ultrasonic Flow Meter installed, Turlock Irrigation District

BENEFITS TO CALIFORNIA

Successful research will impact numerous energy issues. These include:

- Reduction in groundwater pumping (because surface water deliveries will be more flexible, and water tables will remain at higher levels), thus reducing electricity consumption.
- Elimination of future increases in groundwater pumping which will occur if the present water delivery infrastructure is not significantly improved, thus reducing escalations in energy consumption.
- Increased yield per unit of energy consumed, thus improving efficiency ratios.
- More efficient fertilizer practices, thus reducing indirect energy consumption.
- Planning for water transfers throughout the state.
- Reduced vehicular travel (due to automatic systems and remote monitoring), thus reducing fuel energy use and reducing engine emissions, and
- Reduced deterioration of groundwater quality and quantity.

FUNDING AMOUNT

California Energy Commission: $512,585

Project Status

- The first season of field testing for ultrasonic and magnetic flow meters began at Patterson Irrigation District (PID). A comprehensive field testing report has been prepared that summarizes the design, installation and operation of the McCrometer Ultra Mag, Mace AgriFlo, and Unidata Starflow meters installed at three farm turnouts in PID. The performance of each device will be assessed based on factors such as sensor calibration, ease of installation, performance in the field, maintenance requirements, and accuracy over a range of conditions, and costs.
- Information from the first year of testing at PID and other irrigation districts will be used to develop the final detailed evaluation of each flow meter based on actual field applications, in addition to information gathered from the manufacturers and project participants.
- The Ultra Mag Meter and Unidata Starflow were both installed in similar concrete turnout boxes. Delivery data is being logged and will be compared to PID billing records at the end of the irrigation season.
- The ITRC deployed a Unidata Starflow ultrasonic Doppler flow meter at the Tulare Irrigation District (TID).
- The Starflow meter was installed in a new concrete-lined section of the Packwood Creek Canal.

FOR MORE INFORMATION

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